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science for a changing world

# Long-Term Studies: Relating Past Efforts to Future Management Needs

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Photo: P. A. Medica, USGS

# What Do Long-Term Studies Tell Us?

Nevada Division of Wildlife

Todd Esque

USGS

# Long-term Studies Have Taught Us Lessons

- Climate variability is the norm
- Study design should be sound
- Hypotheses should be clearly stated
- Information should be reliable and useful

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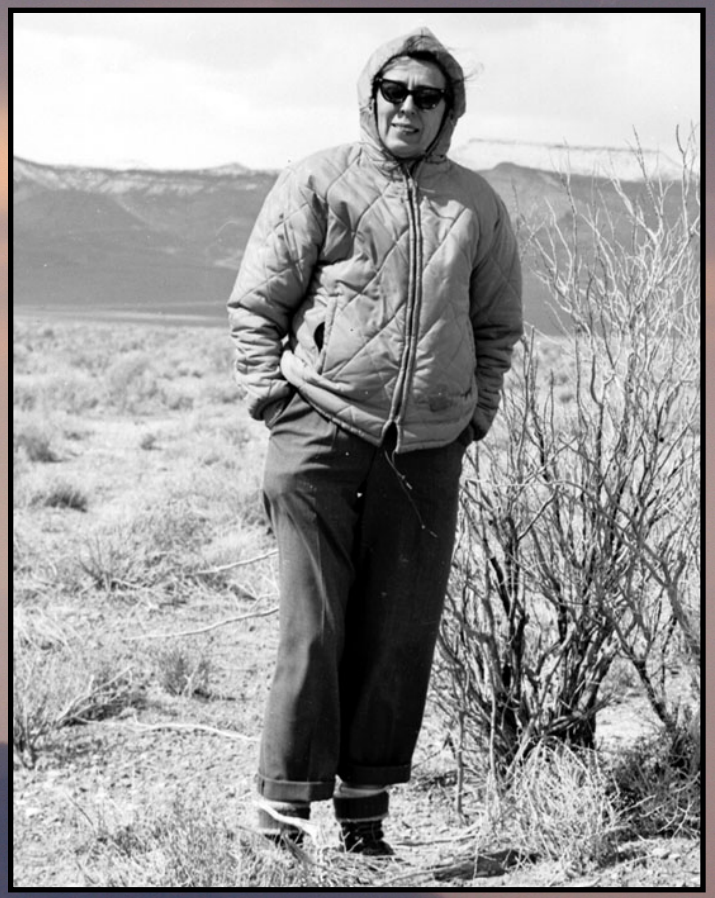
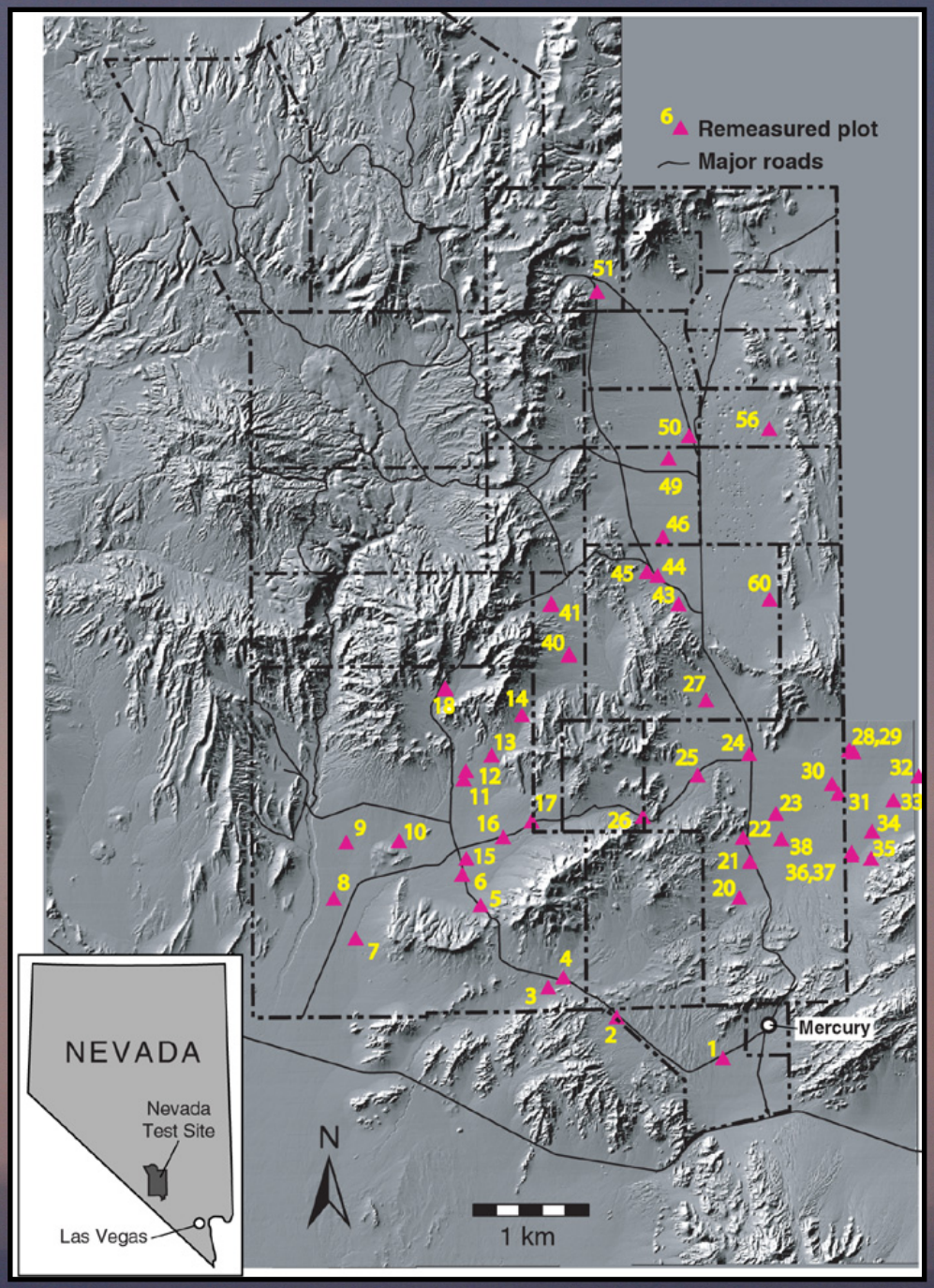
Photo: P. A. Medica, USGS

# Climate Variability



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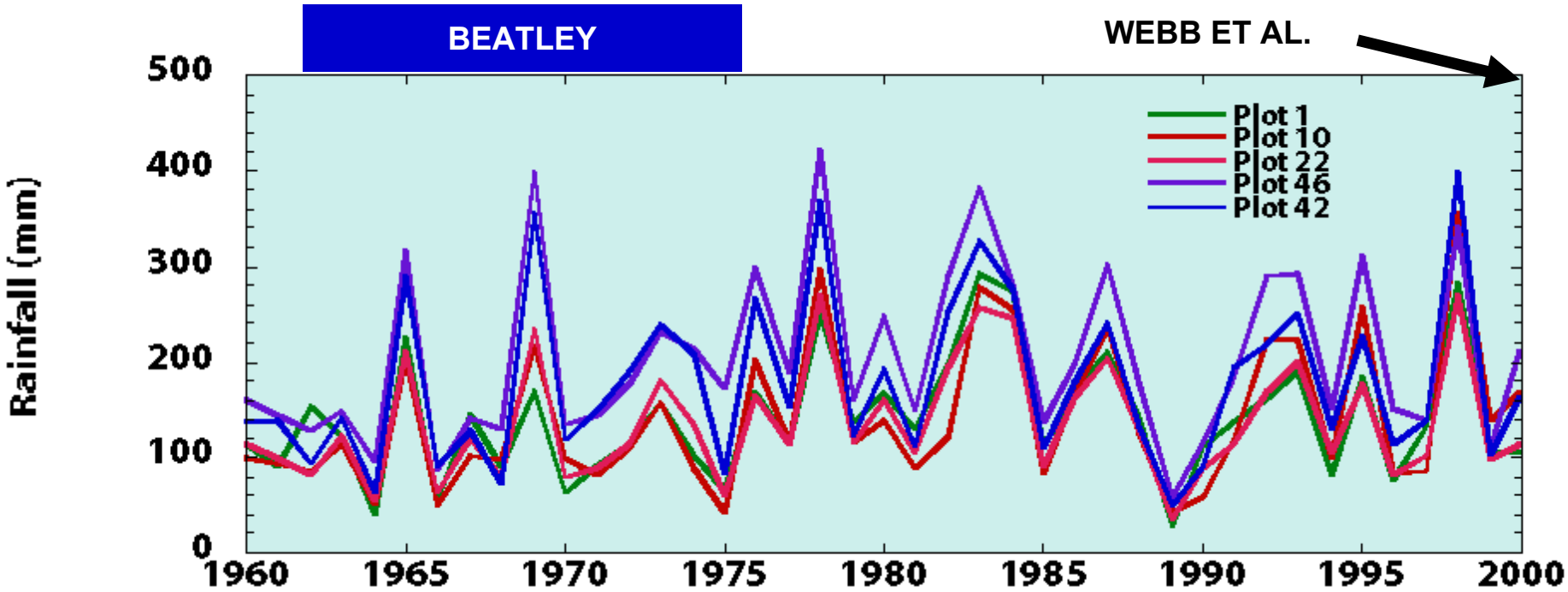
# Climate Varies Temporally (NTS 1960-2000)

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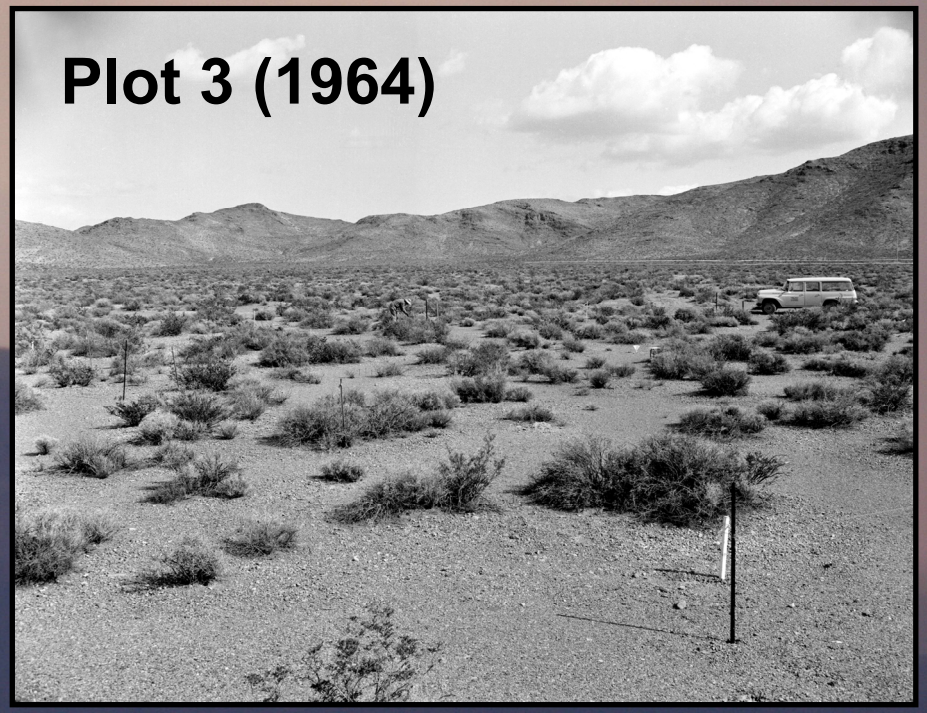
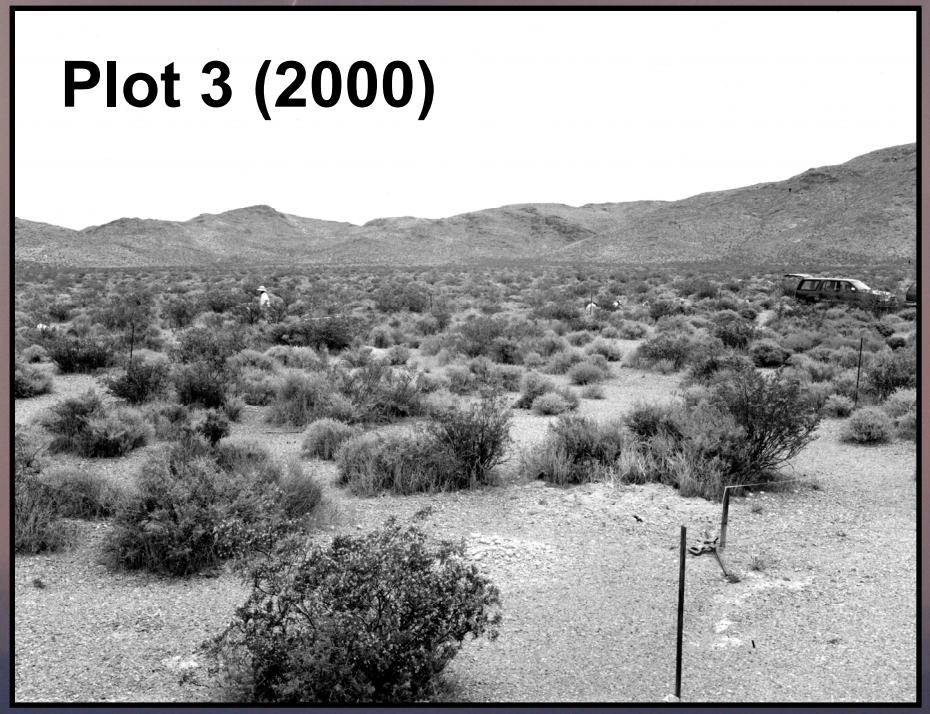
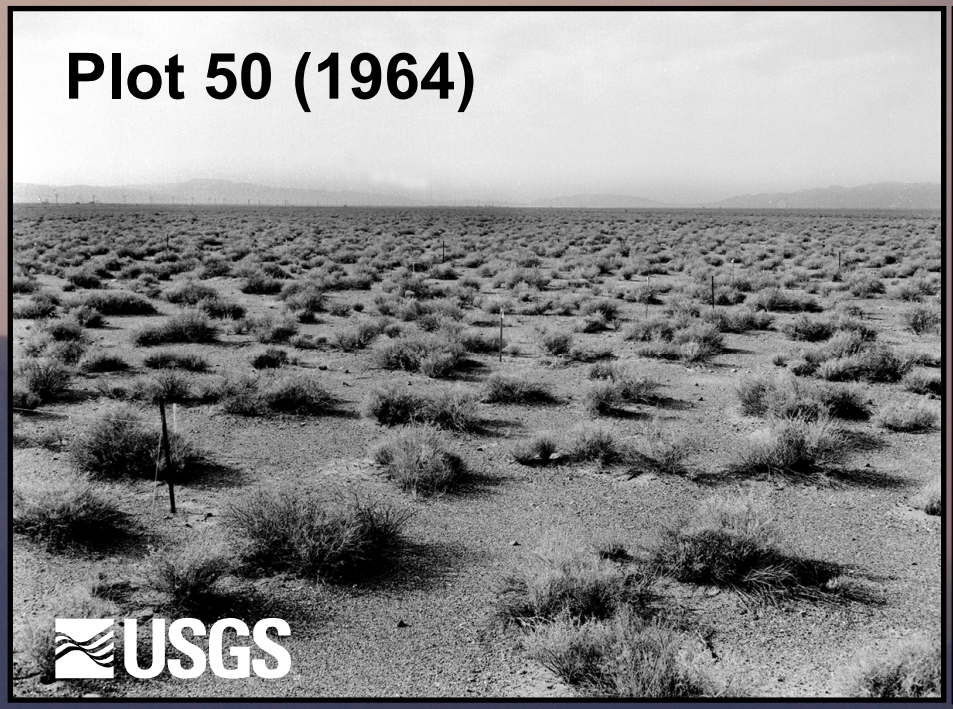
# Perennial Plant Responses

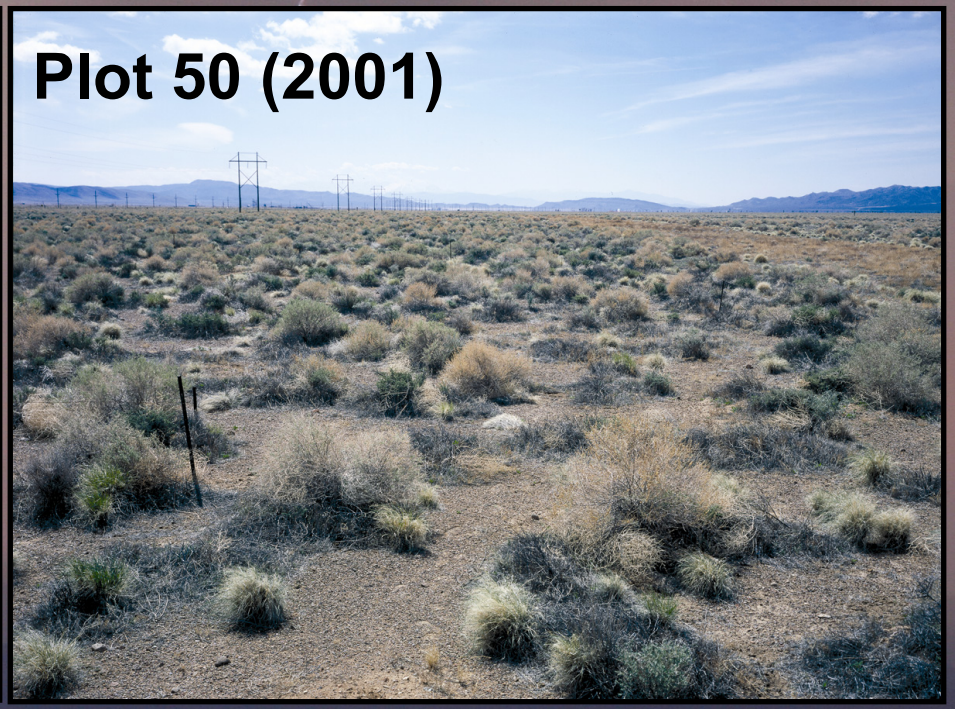
***Larrea*** **and** ***Ephedra*** **canopy cover increased dramatically between 1963 and 2002 (93% and 145% increase, respectively). Few dead individuals of either species died in 1989.**



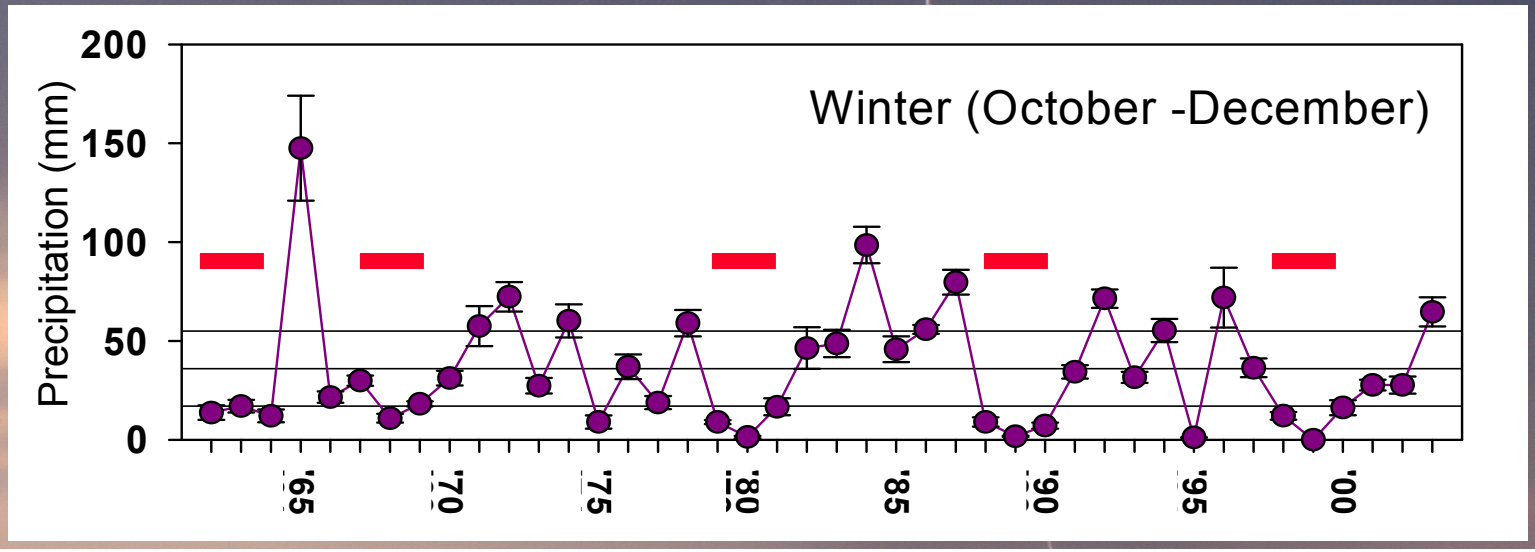



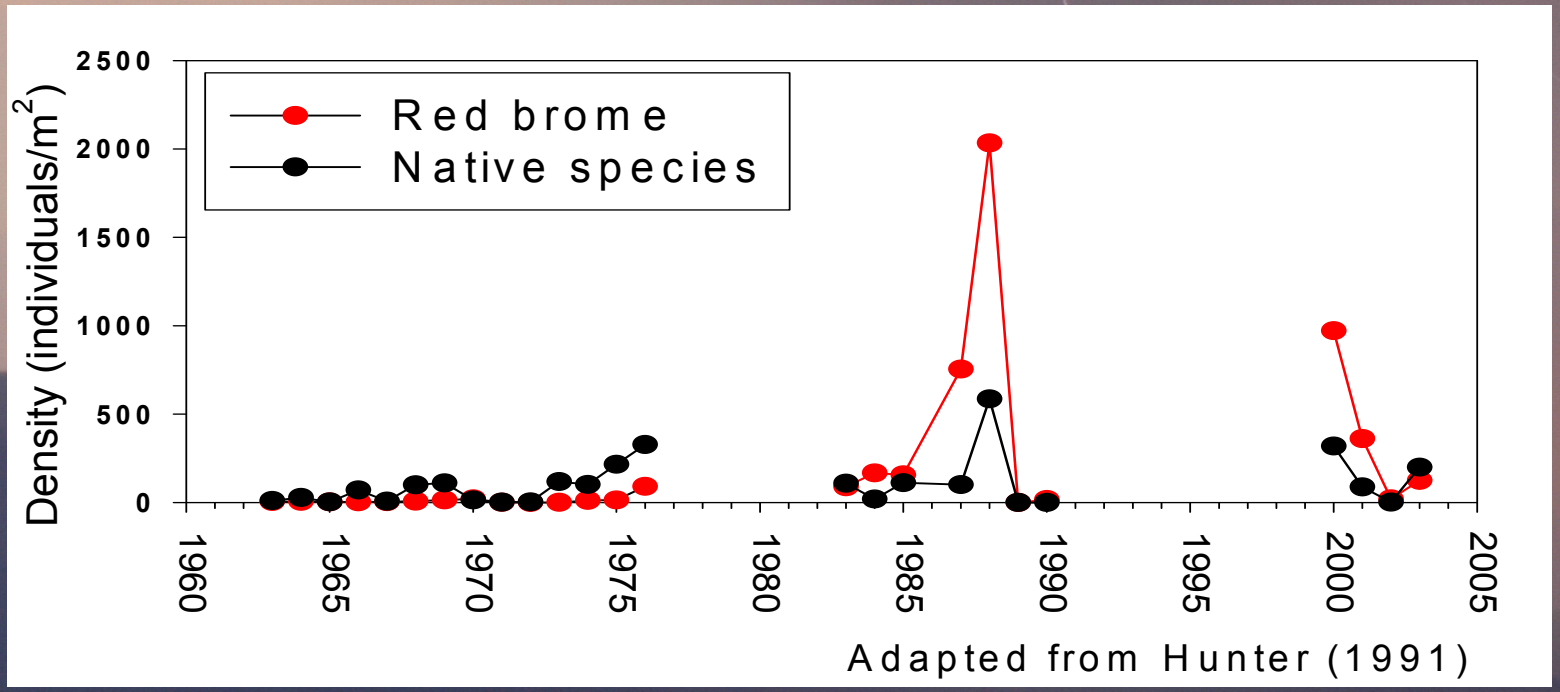
- 1979: Beatley defined 16 vegetation associations in the Mojave and Transition deserts. *Grayia spinosa* was dominant in 8.
- 2000: Ostler et al. defined 10 vegetation associations *Grayia* dominant in 1.
- 1999-2002: Webb et al. found that *Grayia* doesn't dominate any of Beatley's plots; only one plot warranted *Grayia*'s inclusion as an association.



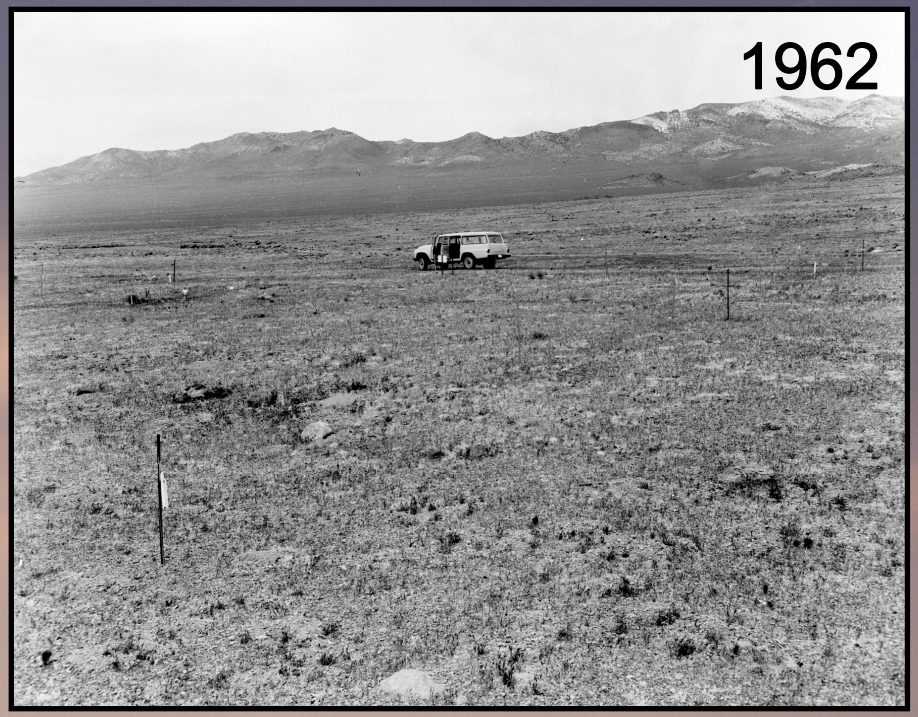



# Winter Annuals



# Winter Annuals: Forty Years of Recovery



- **Loss of native annual species = ~25%**
- **Red brome dominated annual production**
- **Loss not associated with increase in red brome**

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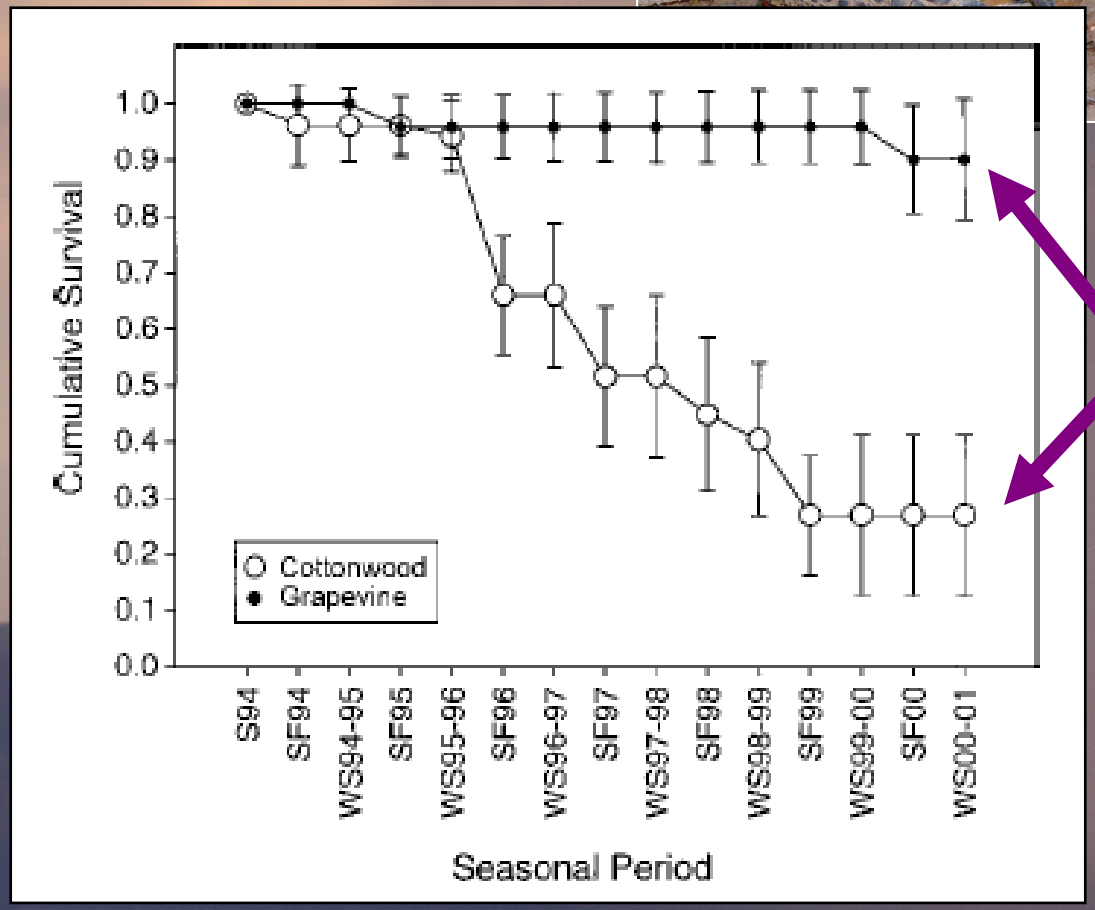
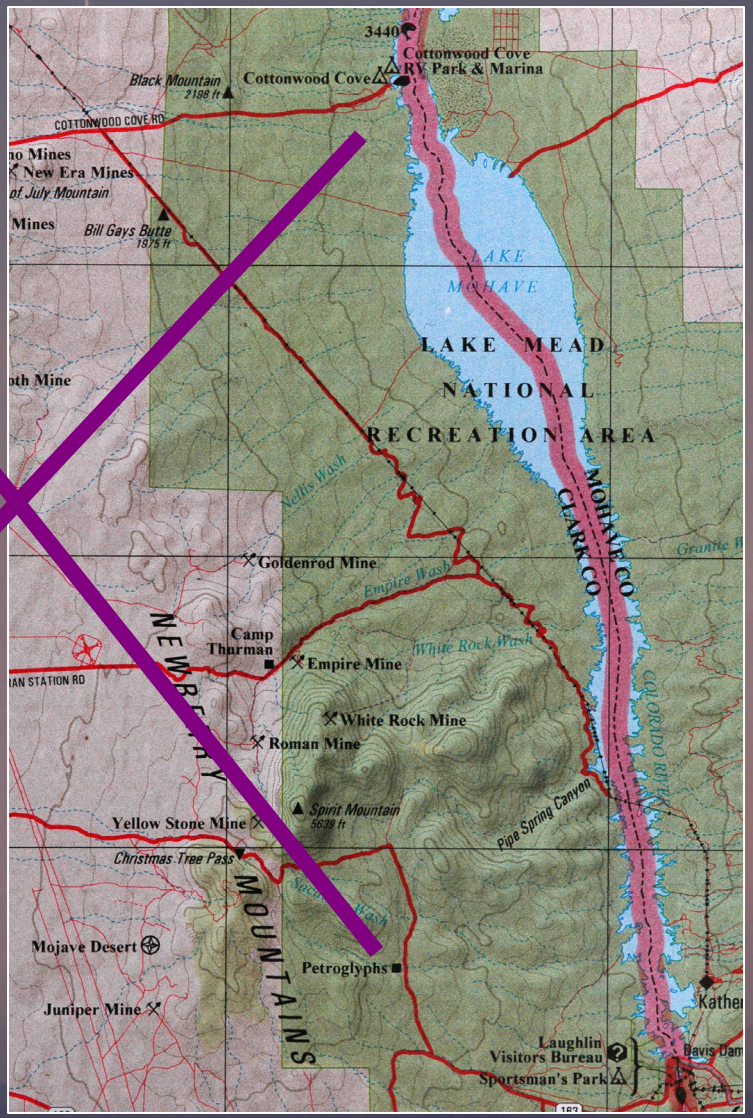
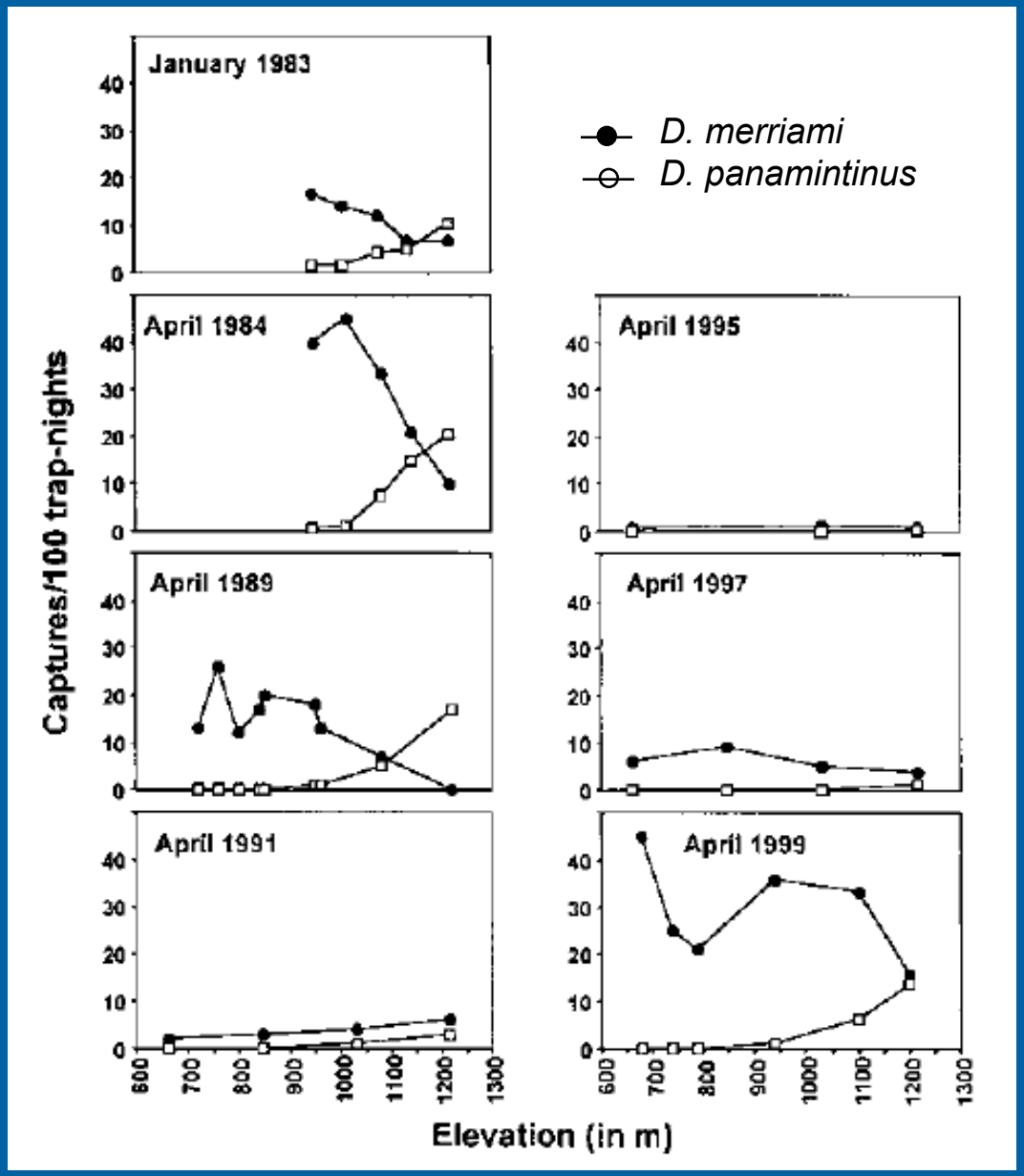
# Climate Varies Spatially




Longshore et al. 2003

# Elevational Distributions: Implications for Climate Change




High Rainfall/High Productivity

- High k-rat densities
- Competition
- Species separation

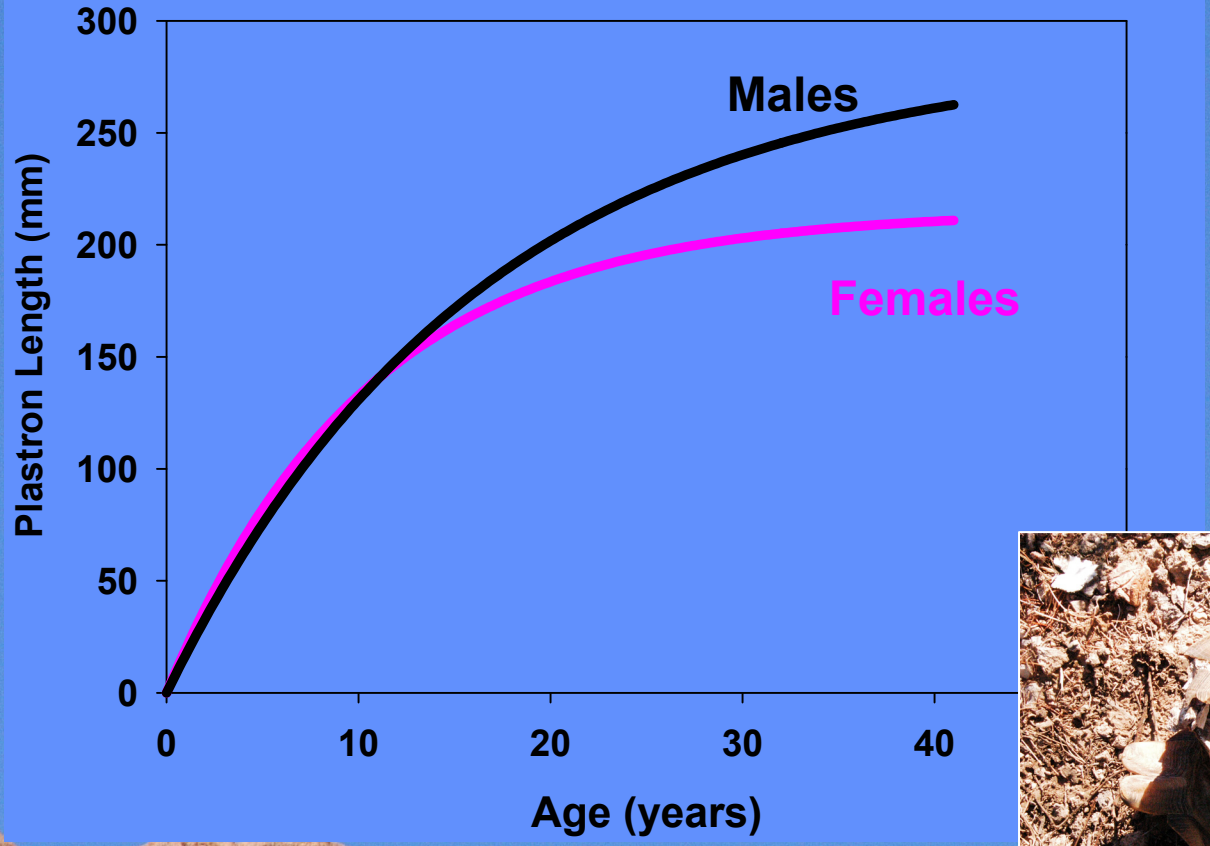
Drought/Low Productivity

- Competitive release
- Species shift (*D. merriami*)
- Species isolation (*D. panamintinus*)

Price et al. 2000

# Study Design

# Unexpected Losses of Individuals, Plots, etc.



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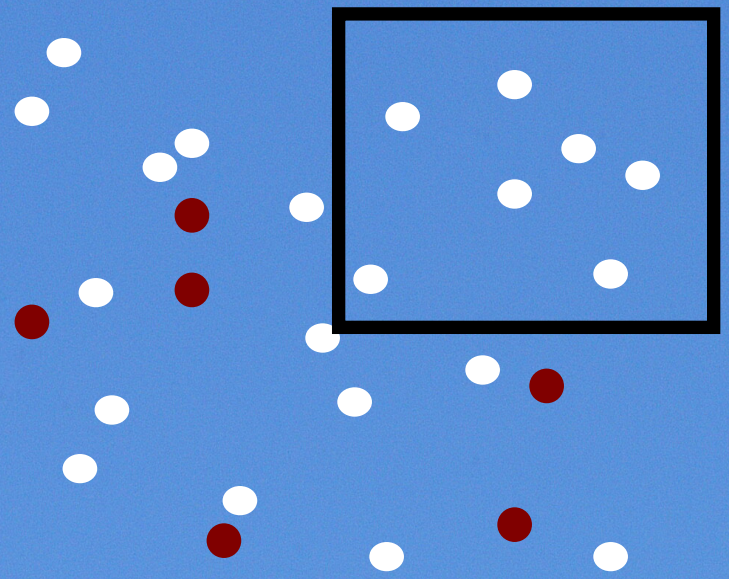
Medica et al (draft)

# Appropriate Sampling Unit: Seed banks



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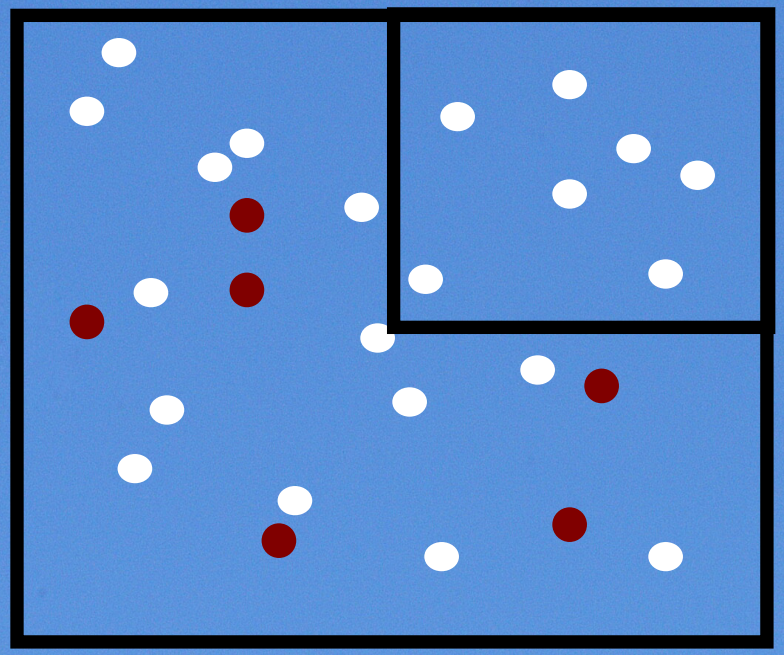

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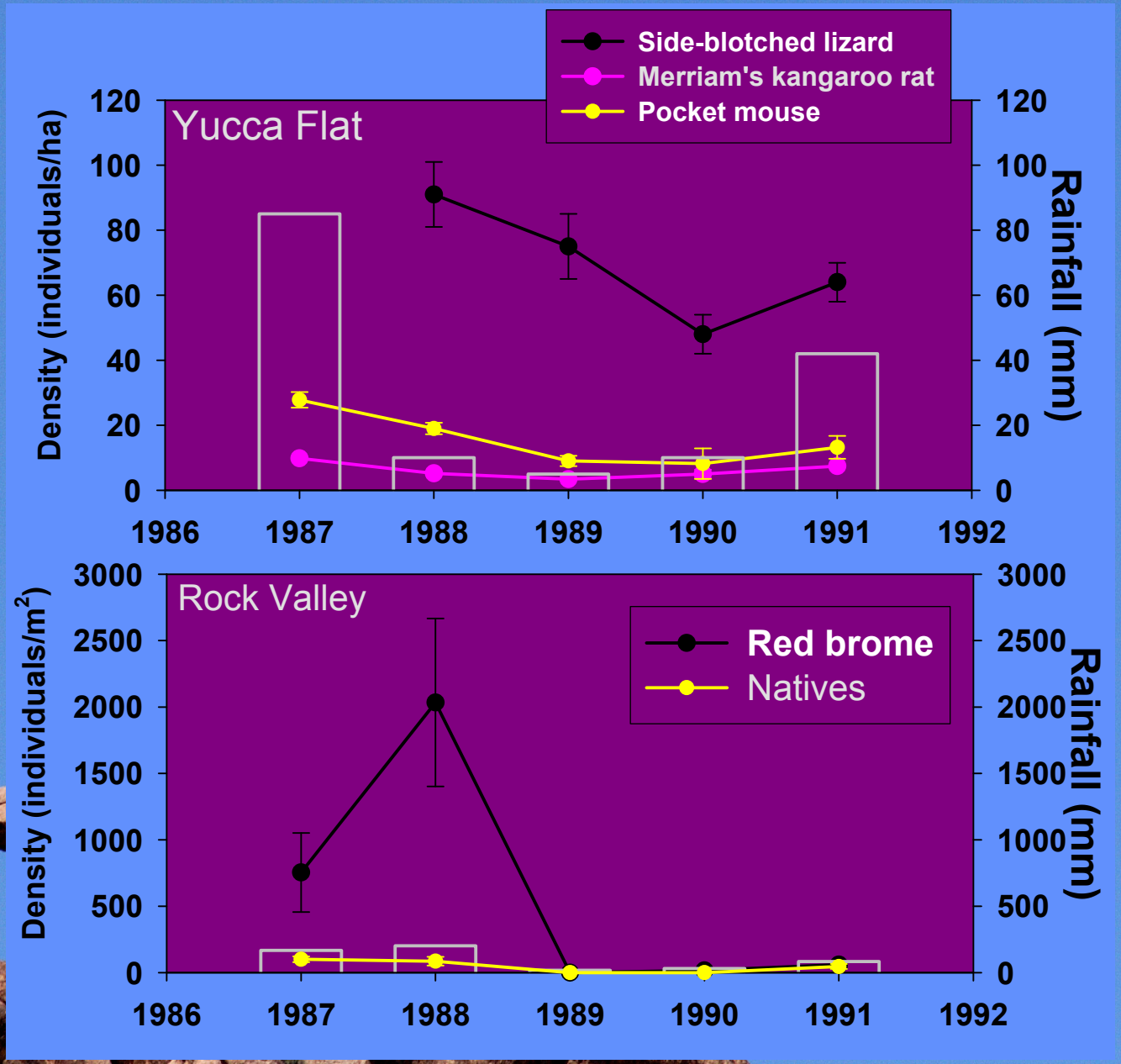


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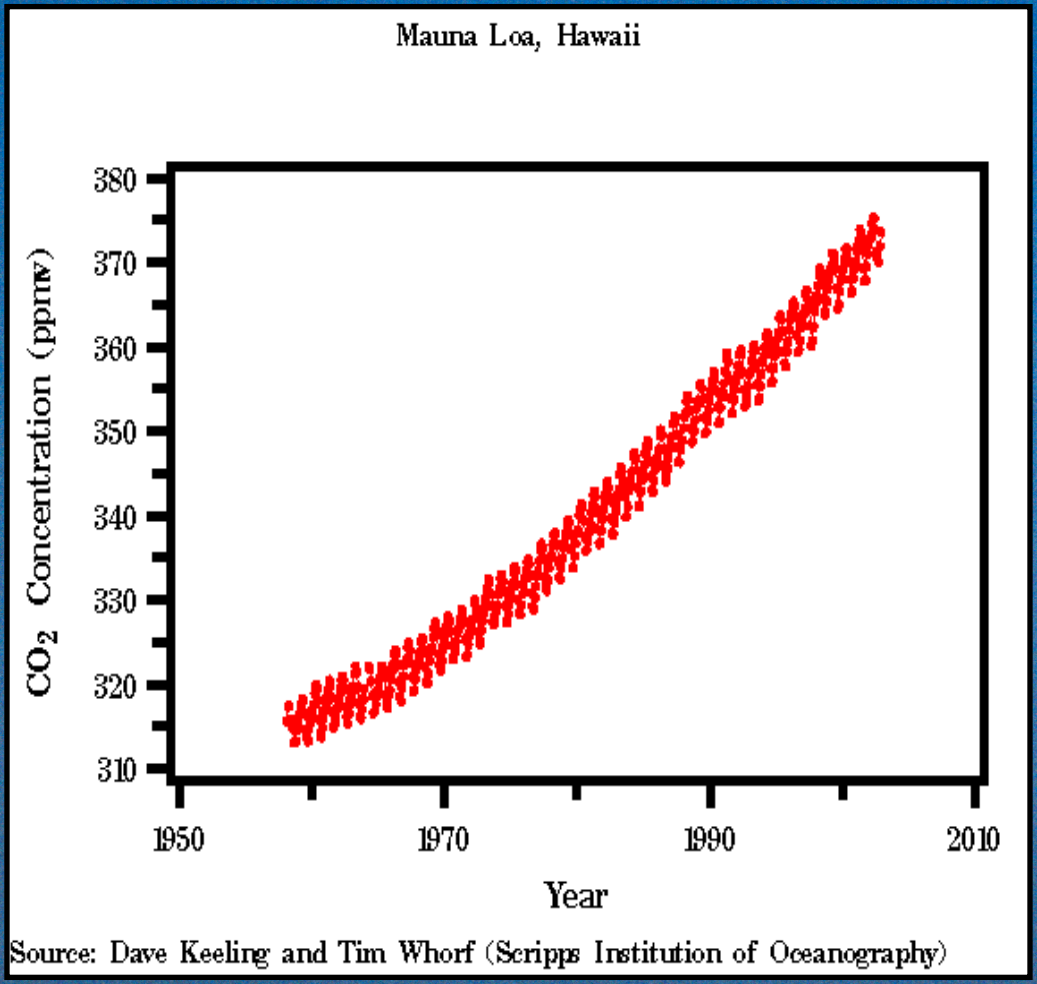
Hunter 1994

# Test Specific Hypotheses

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# Nevada Desert F.A.C.E. Facility

Photos: http://www.unlv.edu/Climate_Change_Research

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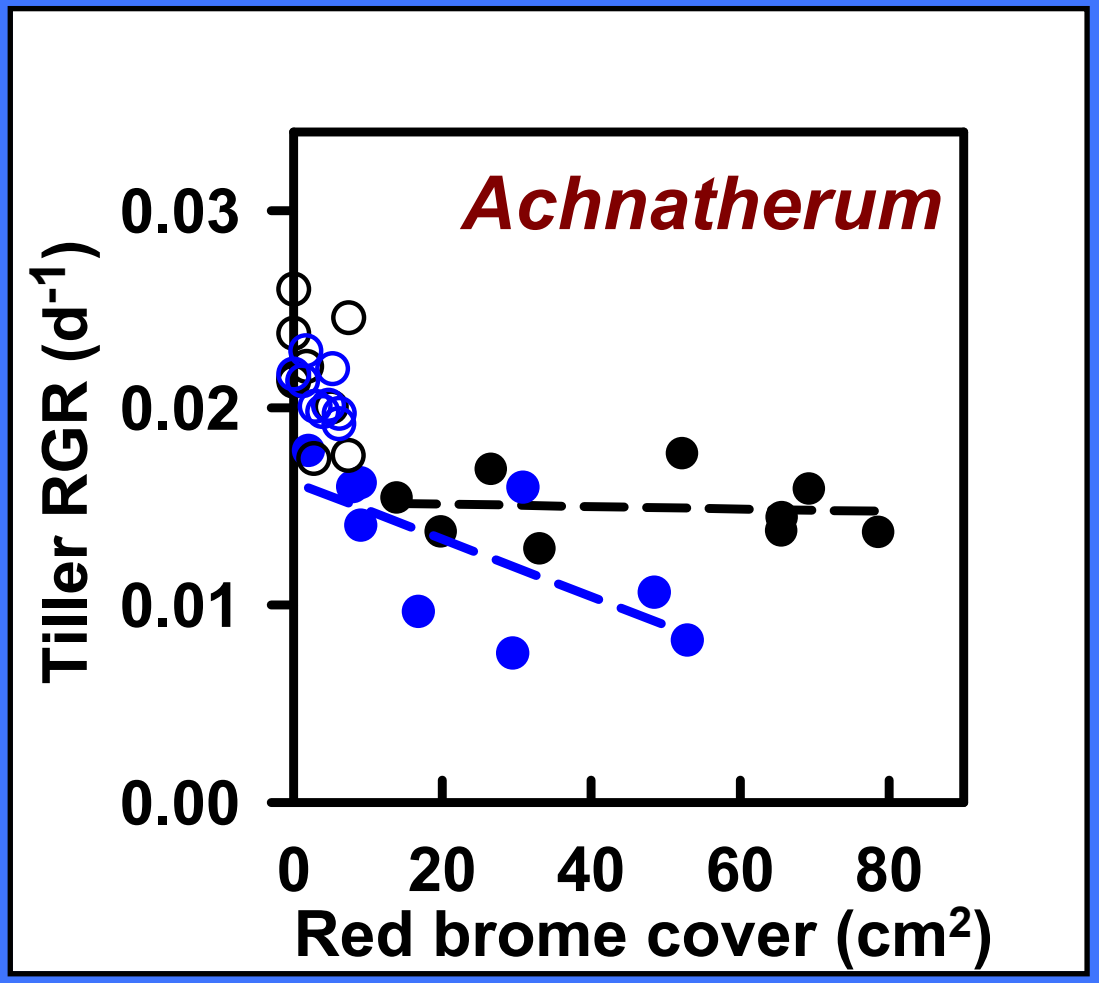
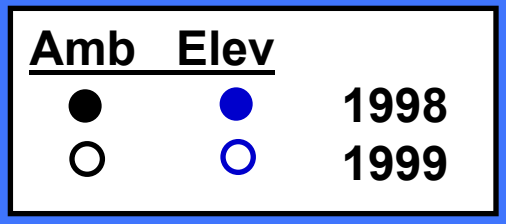
# Nevada Desert F.A.C.E. Facility



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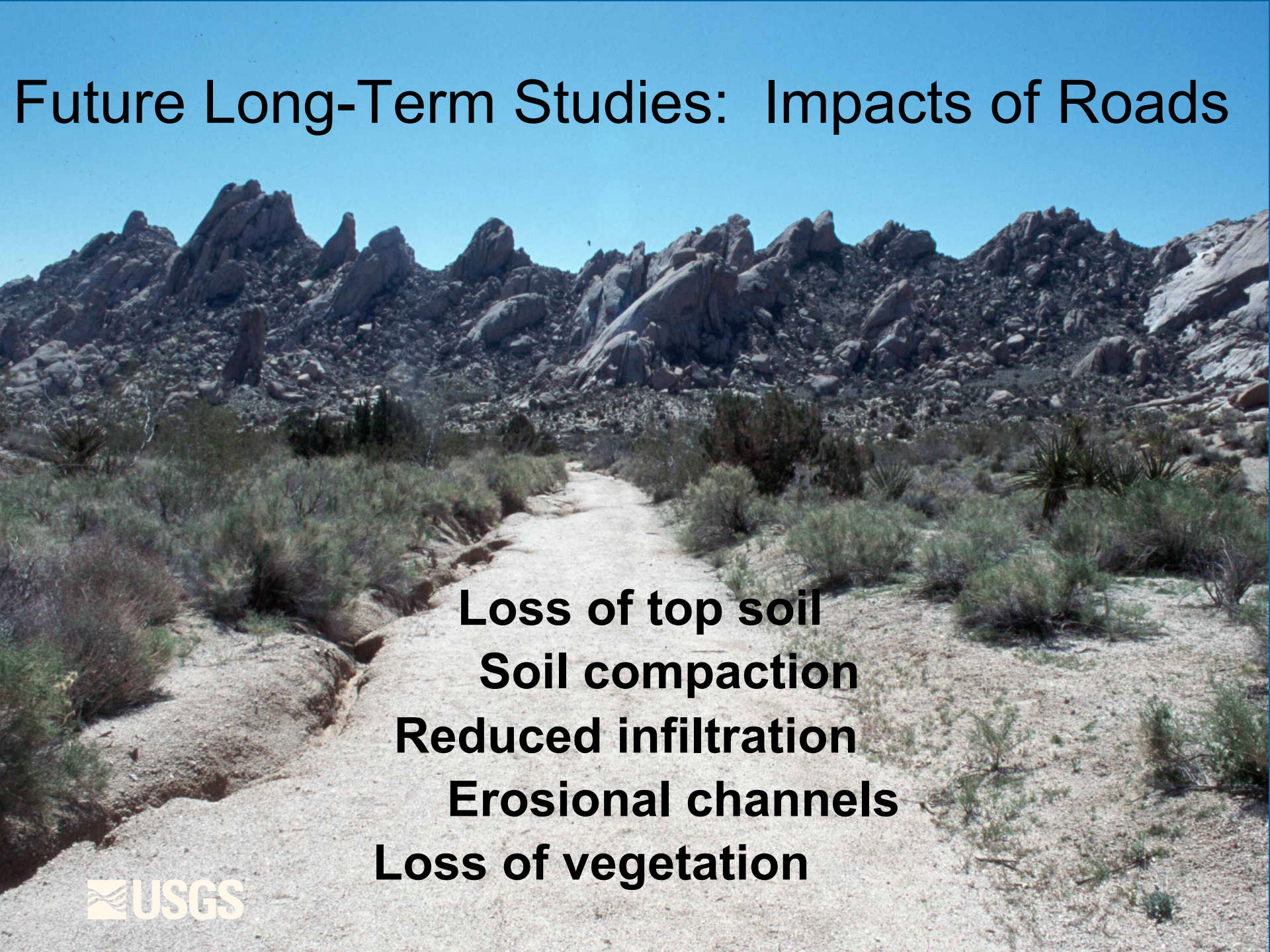
DeFalco 2003

# Future Long-Term Studies: Impacts of Roads



**Loss of top soil**

**Soil compaction**

**Reduced infiltration**

**Erosional channels**

**Loss of vegetation**

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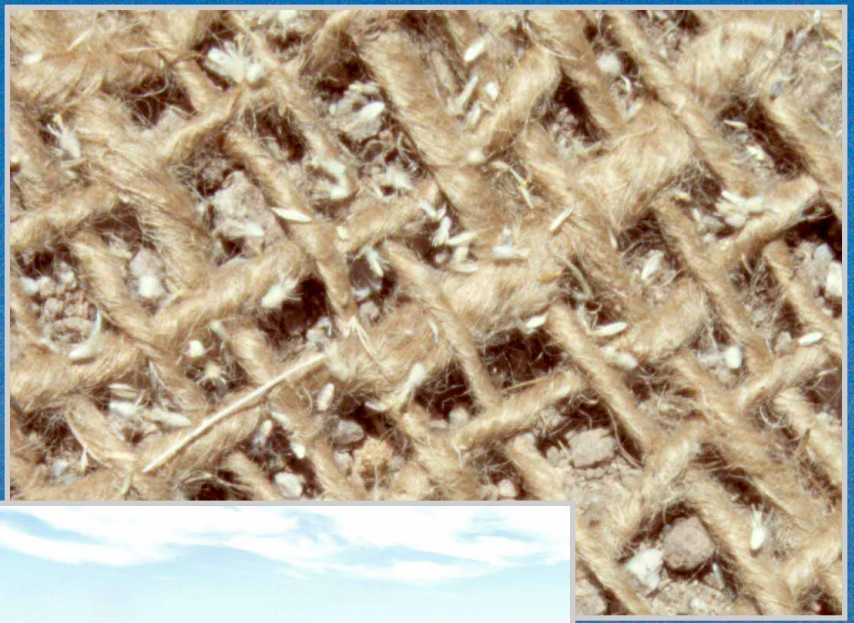
# Methods Used in Restoration



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# Why is hypothesis-driven, long-term monitoring of road restoration important?

- Suitability of restoration methods is uncertain
- Success is dependent upon multiple factors
- Resources may be expended without accountability for success

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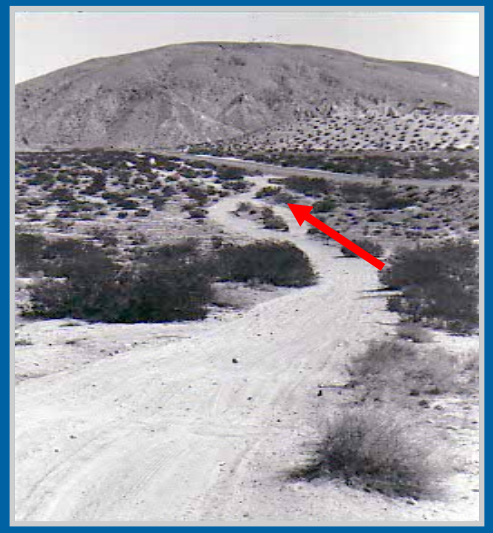
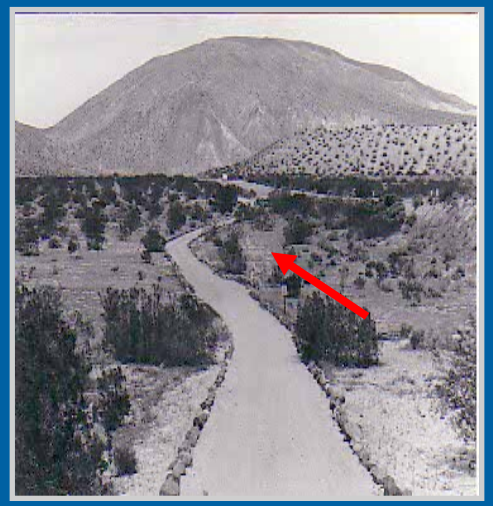
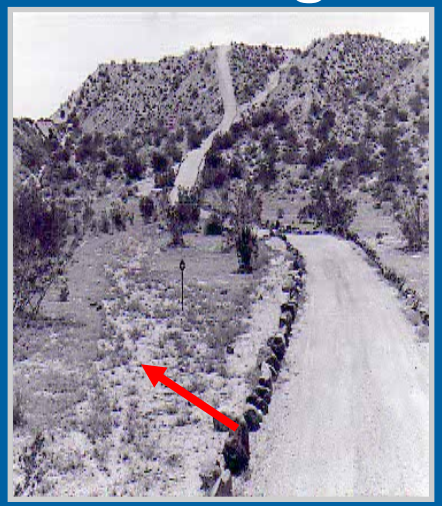
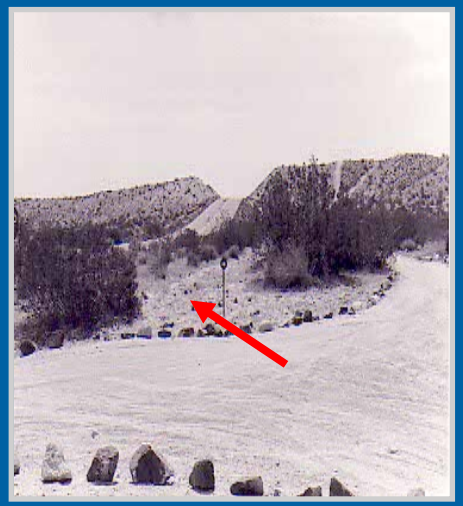
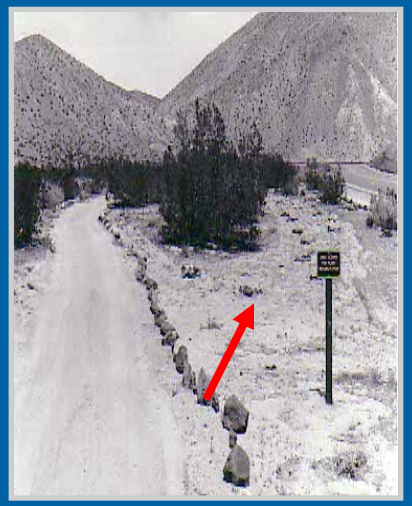
# August, 1985



# August, 1986

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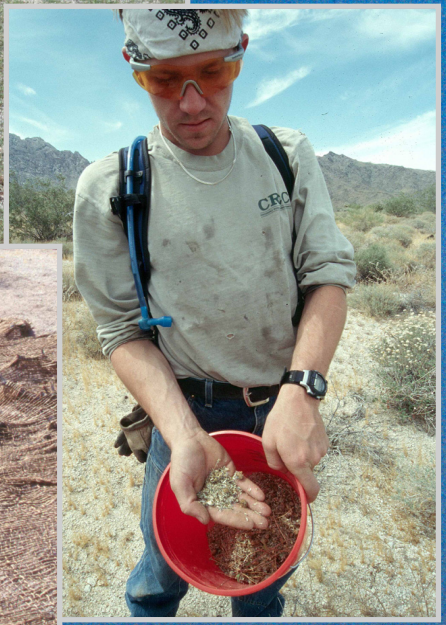
Photos: California State Parks

# An experimental approach

Newberry Mountains, NV
Spring, 2001



Decompaction
- Hand raked
- Ripped using back hoe

Mulch
- Geojute©
- Geojute© + vertical mulch

Seed
- Golden-eye, goldenbush, cheese bush

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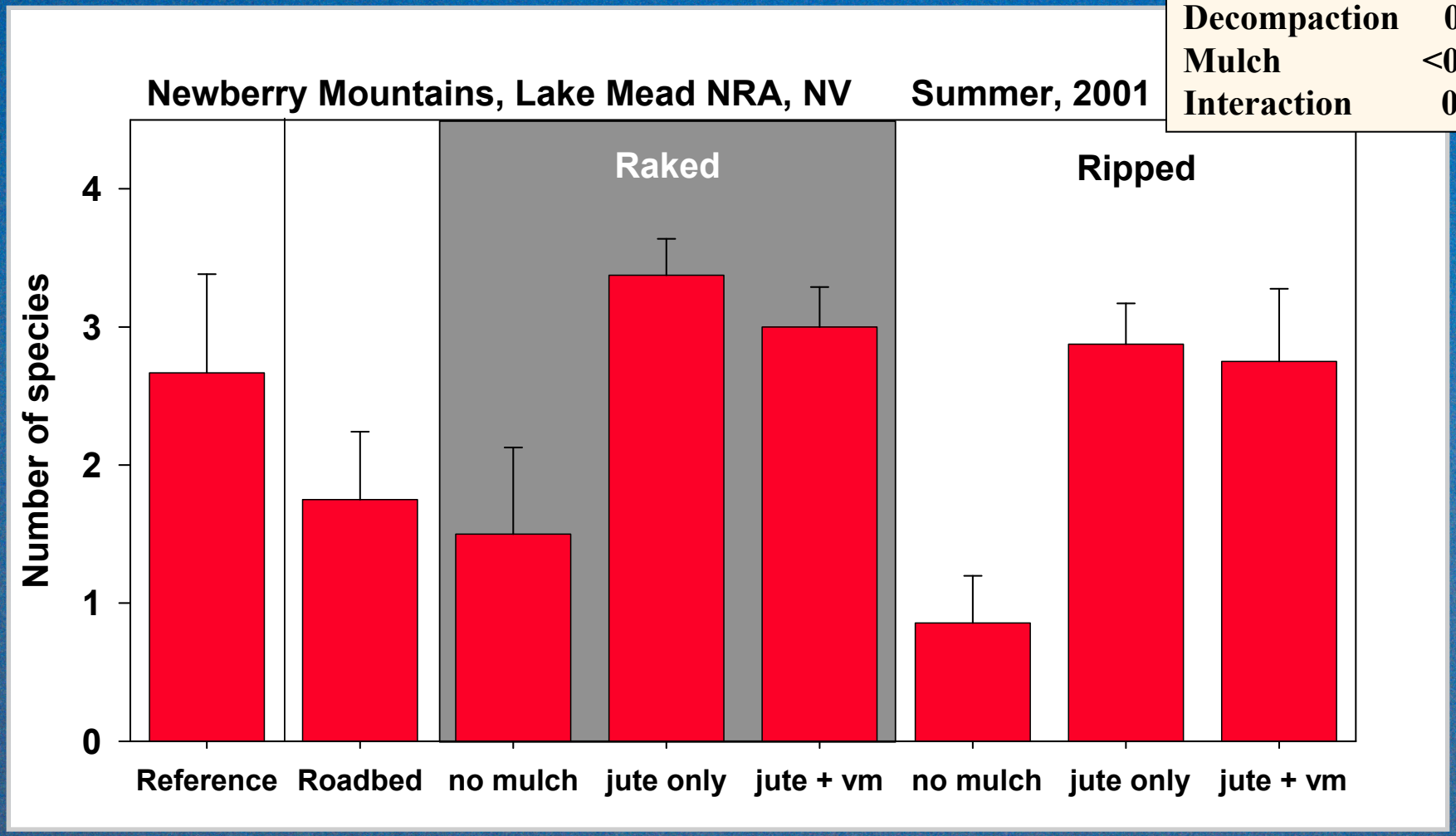
# Seed capture

| Factor | *P* |
|---|---|
| Decompaction | 0.12 |
| Mulch | <0.01 |
| Interaction | 0.84 |

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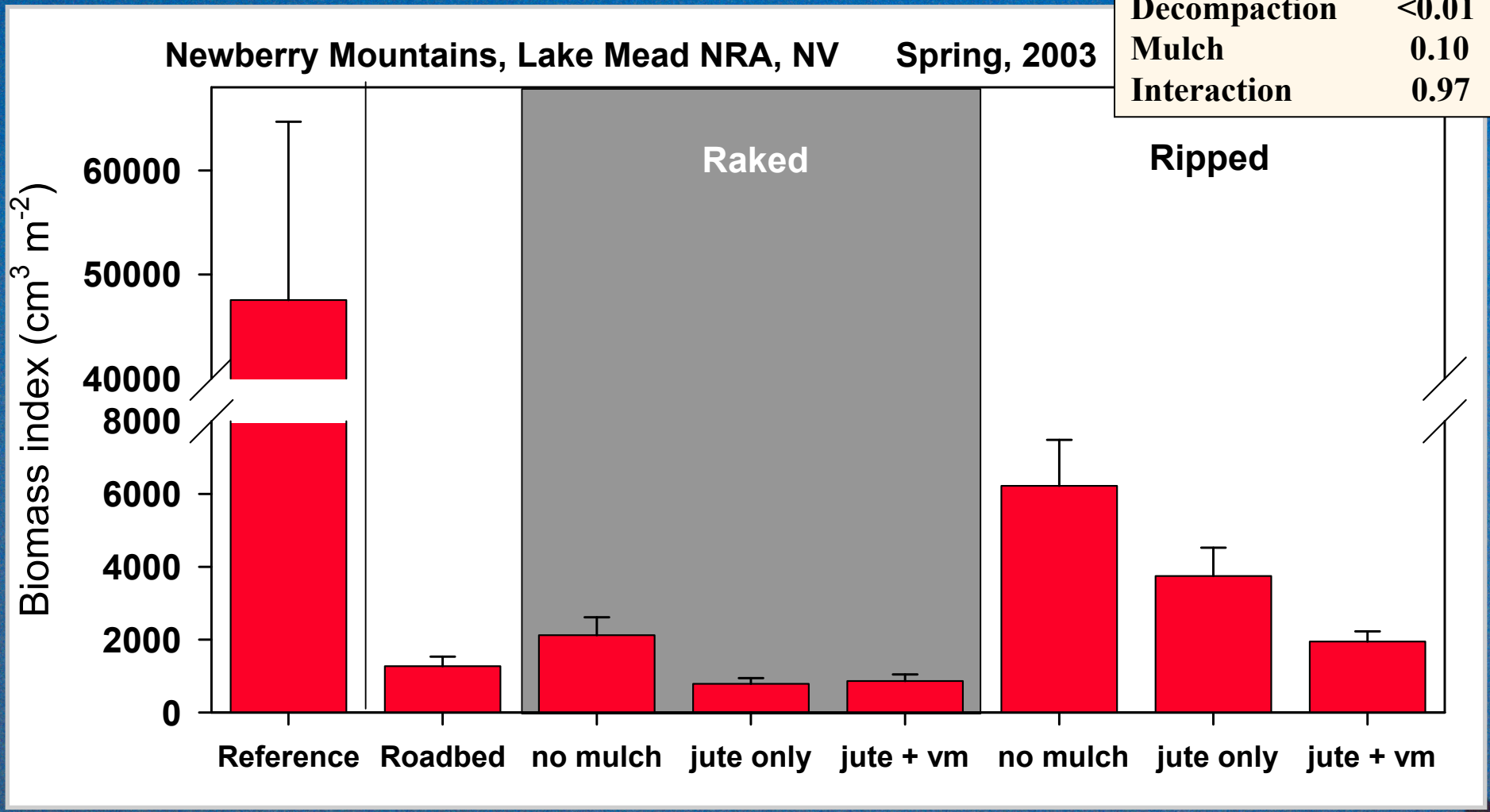
# Non-native annuals

| Factor | P |
|---|---|
| Decompaction | <0.01 |
| Mulch | 0.10 |
| Interaction | 0.97 |

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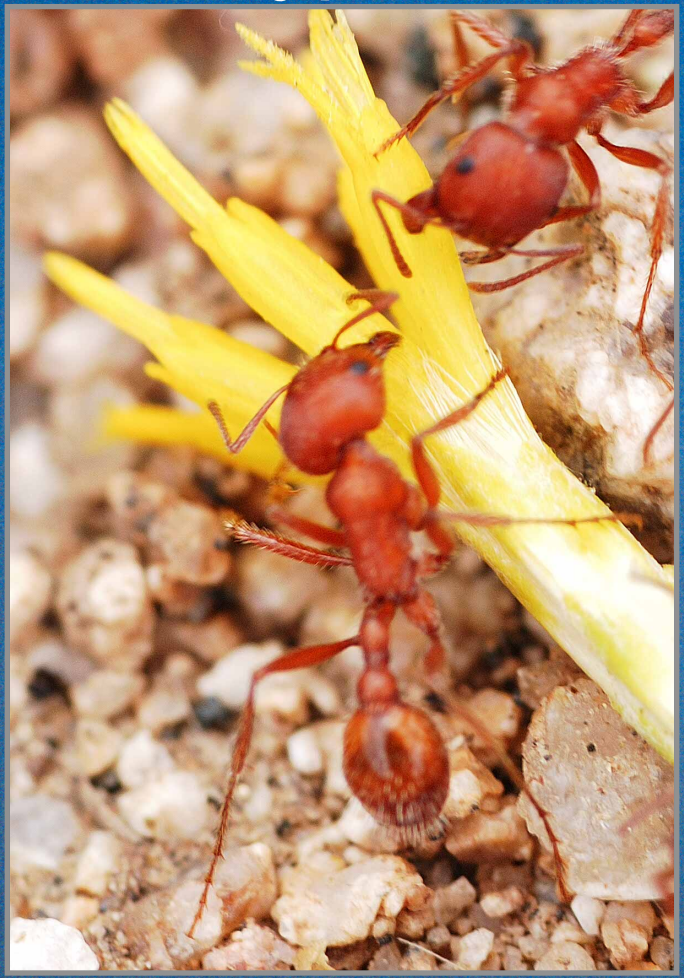
# Hypotheses Yet to Be Addressed



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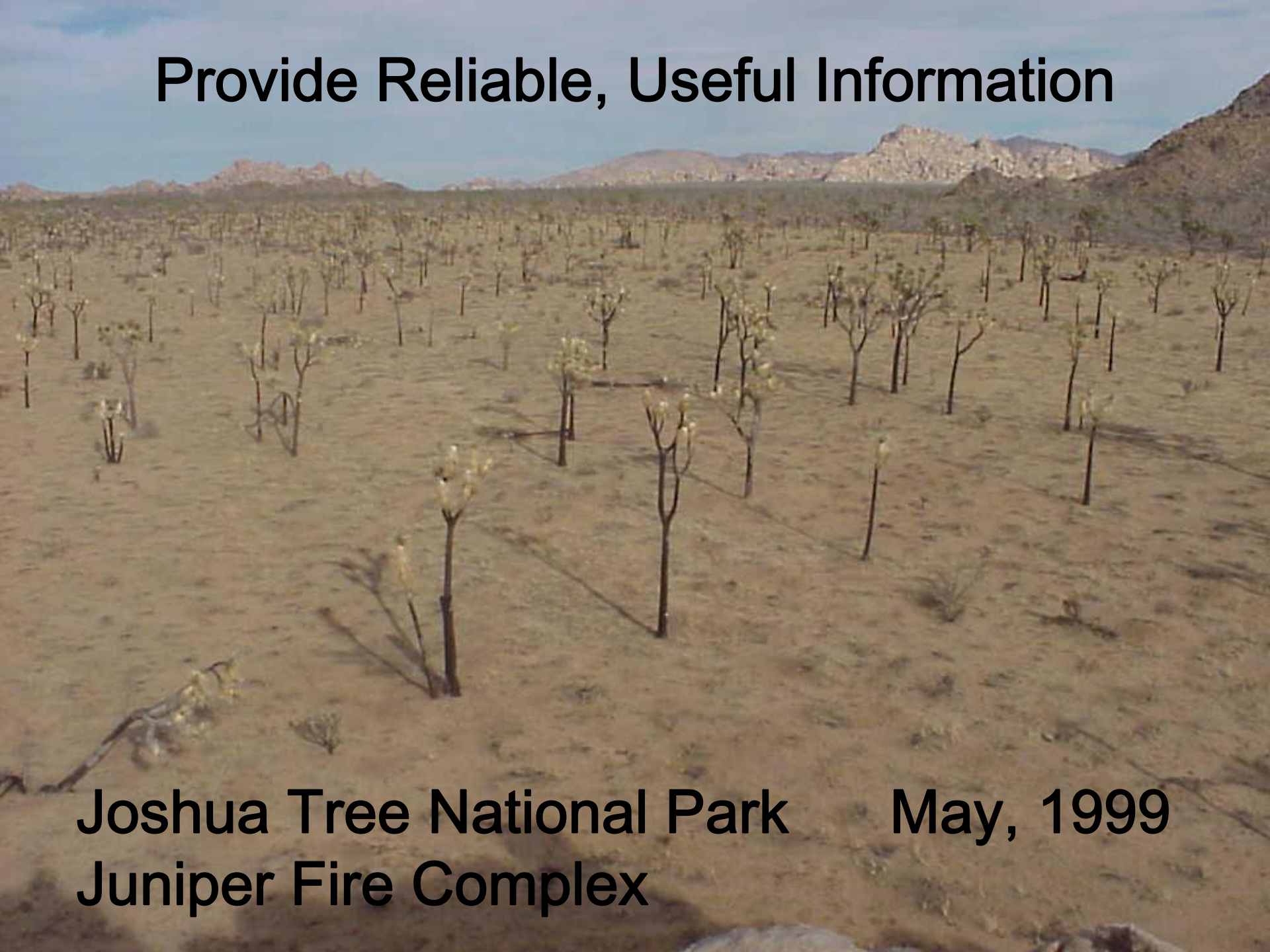
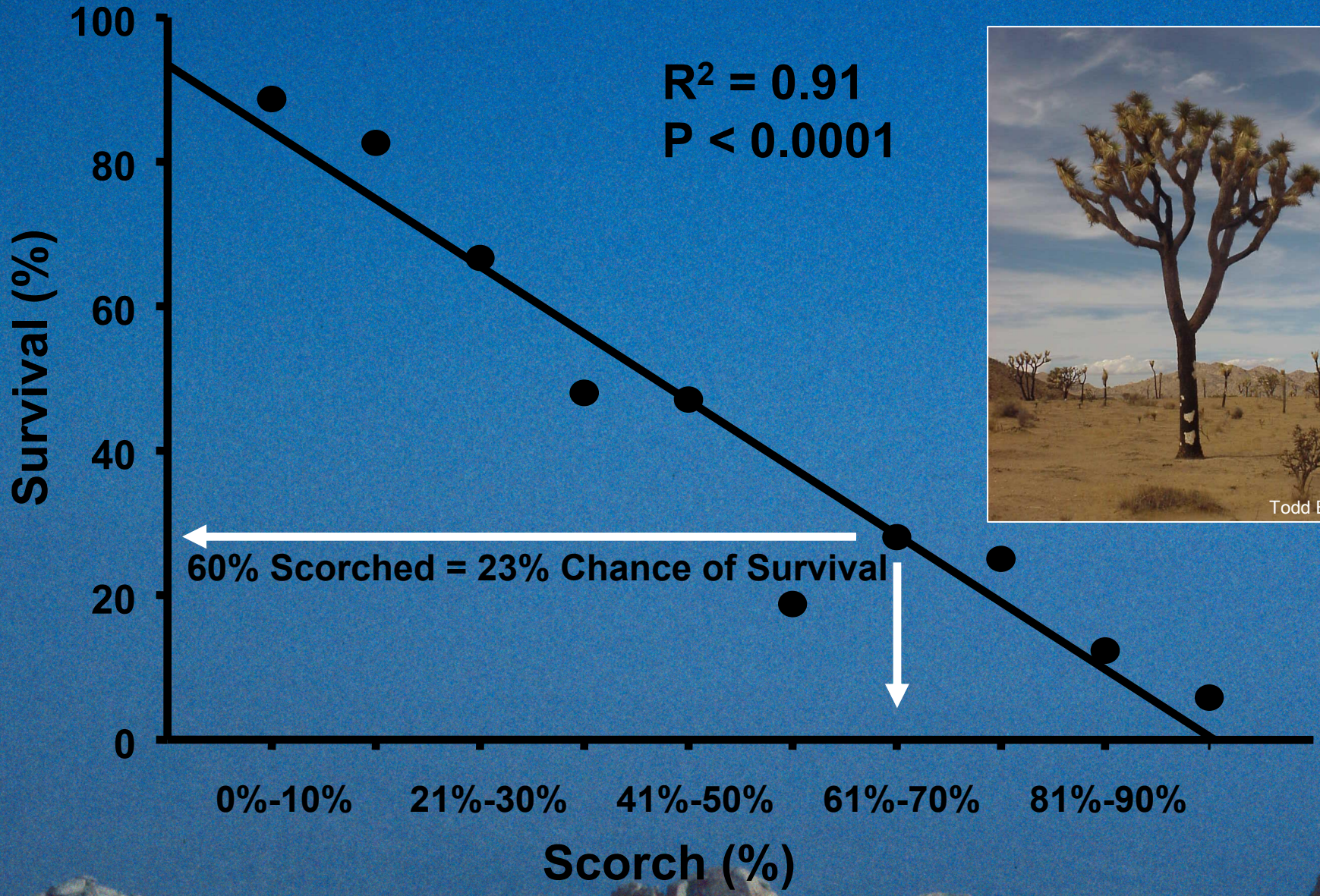
# Provide Reliable, Useful Information



Joshua Tree National Park May, 1999
Juniper Fire Complex



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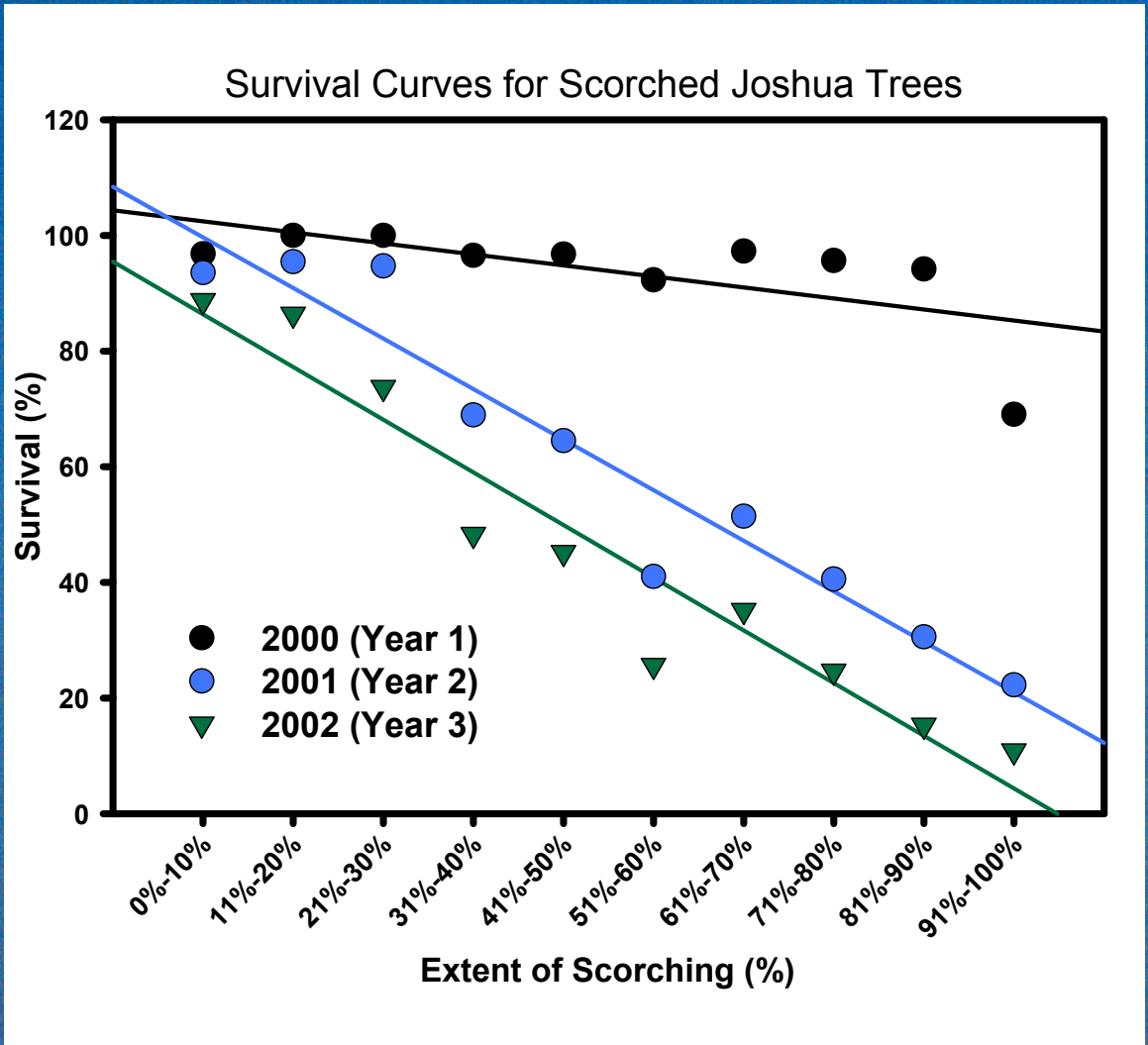
Esque et al.




USGS

Esque et al.

# Parting Thoughts...

- We may not yet know what “Long-Term is?
- Previous long-term studies may have little value; well-designed short-term studies may become useful;
- Everything we’ve learned about recovery/restoration should be understood in the context of past climate